

L Number	Hits	Search Text	DB	Time stamp
1	5	((("6241760") or ("5954743") or ("6152957") or ("5922021"))).PN.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/04/02 08:56
2	3	((("6241760") or ("5954743") or ("6152957") or ("5922021"))).PN.) and taper\$.clm.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/04/02 07:54
3	1502	((606/198) or (623/1.16,1.17,23.7,1.13)).CCLS.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/04/02 09:44
4	680	(623/1.15,1.3,1.31).CCLS.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/04/02 09:28
5	67	(623/1.3,1.31).CCLS.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/04/02 09:28
6	630	(623/1.15).CCLS.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/04/02 10:20
7	2	("5716393" "5749919").PN.	USPAT	2003/04/02 09:53
8	14	("5102417" "5449373" "5591197" "5669932" "5697971" "5776161" "5776183" "5800521" "5800526" "5807404" "5810872" "5824043" "5836964" "5843120").PN.	USPAT	2003/04/02 09:58
9	13	("4743251" "5064435" "5383892" "5449373" "5575818" "5683411" "5693086" "5725549" "5741333" "5755769" "5800508" "5800514" "5824059").PN.	USPAT	2003/04/02 10:05
10	547	(taper or tapered or tapering) and stent and strut	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/04/02 10:21
11	80	(taper or tapered or tapering) same stent same strut	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/04/02 10:21

	Document I	R	Source	Page	
1	US 6348065		USP:20000822	13	N
2	US 6106548		USP:20000822	13	N
3	US 5922019		USP:19990713	10	C
4	US 5907893		USP:19990601	30	N
5	US 5853419		USP:19981229	5	S
6	US 5776583		USP:19980707	7	F
7	US 5776161		USP:19980707	19	N
8	US 5628788		USP:19970513	15	S
9	US 5609627		USP:19970311	36	N
10	US 5575818		USP:19961119	13	P
11	US 5354308		USP:19941011	10	N
12	US 5064435		USP:19911112	9	S
13	EP 758216		DER:20021201		T
14	US 5827321		DER:20021105		J
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19	US 5776161		DER:19980707		F
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21	US 5575818		DER:19960822		F
22	EP 759729		DER:19950817		F
23	US 5354308		DER:19941011		S
24	US 5064435		DER:19911112		S



US06348065B1

(12) United States Patent

Brown et al.

(10) Patent No.: US 6,348,065 B1
(45) Date of Patent: Feb. 19, 2002

(54) LONGITUDINALLY FLEXIBLE EXPANDABLE STENT

(73) Inventors: Brian J. Brown, Hancock; Michael L. Davis, Shonwood, both of MN (US)
(72) Assignee: Schmed Life Systems, Inc., Maple Grove, MN (US)

(*) Notice: This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).
Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: 09/712,431

(22) Filed: Jul. 24, 1998

Related U.S. Application Data

(63) Continuation of application No. 08/511,075, filed on Aug. 3, 1995, which is a continuation-in-part of application No. 08/596,569, filed on Mar. 1, 1995, now abandoned.

(51) Int. Cl. A61F 2/06

(52) U.S. Cl. 639/1.14; 606/198; 623/1.19

(58) Field of Search 623/1.15, 1.16, 623/1.17, 1.18, 1.19; 606/195, 198

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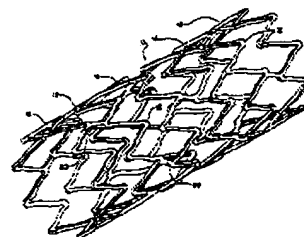
(List continued on next page.)

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(57)

ABSTRACT

The invention provides a tubular expandable stent including a plurality of cylindrically shaped open cylindrical segments aligned on a common longitudinal axis to define a generally tubular stent body, each segment being defined by a member formed in an undulating flexible pattern of interconnected subunits by parallel struts with pairs thereof having alternating interconnecting end portions to define the periphery of the expandable stent segment, and in which the connected end portions of paired struts in each segment, before the stent is expanded, are positioned substantially opposite to connected end portions of paired struts in adjacent segments.

45 Claims, 3 Drawing Sheets



US-PAT-NO: 5853419
DOCUMENT-IDENTIFIER: US 5853419 A
TITLE: Stent

----- KWIC -----

Another embodiment of the invention is shown in FIG. 7 which shows a portion of a stent 61 having struts 62 spaced apart longitudinally of the axis of the stent and adjoining longitudinally extending circumferentially spaced apart ribs 63. The struts 62 rather than being of all of the same length as in the previous embodiments hereinbefore described have differing lengths. Thus as shown in FIG. 7, the strut 62 immediately adjacent the left end of the stent 61 as shown in FIG. 7 is longer than the other struts. This makes it possible when the stent 61 is expanded as shown in FIG. 8 to have one end, the end adjacent the longer strut 62 to be flared outwardly as shown and to taper inwardly gradually to a smaller diameter. This flaring on one end may be desirable in certain applications in which it is desirable that the stent more securely grasp the vessel, as for example a carotid artery, in which it is

disposed to prevent longitudinal movement of the stent after the stent has been deployed. This additional expansion at one end can be readily achieved merely by expansion of the balloon used for expanding the stent. Similarly, if it is desired to have flared ends at both ends of the stent as shown in FIG. 9, this can be readily accommodated by providing a stent 71 having struts 72 spaced apart longitudinally of the axis and between longitudinally extending circumferentially spaced apart ribs 73 as shown in FIG. 9. To accomplish this it is merely necessary to provide struts 72 at opposite ends having greater lengths than the struts therebetween to achieve flanged portions at both ends of the stent to aid in again assuring that the stent will firmly grasp the walls of the vessel in which it is placed and will be retained in that location. Such a stent can also be deployed in a conventional manner by the use of a balloon or by providing a self-expanding stent.

US-PAT-NO: 5853419
DOCUMENT-IDENTIFIER: US 5853419 A
TITLE: Stent

----- KWIC -----

Another embodiment of the invention is shown in FIG. 7 which shows a portion of a stent 61 having struts 62 spaced apart longitudinally of the axis of the stent and adjoining longitudinally extending circumferentially spaced apart ribs 63. The struts 62 rather than being of all of the same length as in the previous embodiments hereinbefore described have differing lengths. Thus as shown in FIG. 7, the strut 62 immediately adjacent the left end of the stent 61 as shown in FIG. 7 is longer than the other struts. This makes it possible when the stent 61 is expanded as shown in FIG. 8 to have one end, the end adjacent the longer strut 62 to be flared outwardly as shown and to taper inwardly gradually to a smaller diameter. This flaring on one end may be desirable in certain applications in which it is desirable that the stent more securely grasp the vessel, as for example a carotid artery, in which it is

disposed to prevent longitudinal movement of the stent after the stent has been deployed. This additional expansion at one end can be readily achieved merely by expansion of the balloon used for expanding the stent. Similarly, if it is desired to have flared ends at both ends of the stent as shown in FIG. 9, this can be readily accommodated by providing a stent 71 having struts 72 spaced apart longitudinally of the axis and between longitudinally extending circumferentially spaced apart ribs 73 as shown in FIG. 9. To accomplish this it is merely necessary to provide struts 72 at opposite ends having greater lengths than the struts therebetween to achieve flanged portions at both ends of the stent to aid in again assuring that the stent will firmly grasp the walls of the vessel in which it is placed and will be retained in that location. Such a stent can also be deployed in a conventional manner by the use of a balloon or by providing a self-expanding stent.

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40	US 5578075	USP	19961126	11	M
41	US 5591227	USP	19970107	14	D
42	US 5591224	USP	19970107	14	B
43	US 5591223	USP	19970107	5	R
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74	US 5741293	USP	19980421	18	L
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77	US 5755771	USP	19980526	10	E
78	US 5766710	USP	19980616	12	B
	US 5776183	USP	19980707	7	B

United States Patent [19] Kanesaka et al.

[11] Patent Number: 5,776,183
[45] Date of Patent: Jul. 7, 1998

[54] EXPANDABLE STENT

[76] Inventors: Noriomi Kanesaka, 36 Cathy Rd.;
George A. Thalh, 24 Cathy Rd., both
of Hillsdale, N.J. 07642

[21] Appl. No.: 782,167

[22] Filed: Aug. 23, 1996

[31] Int. Cl. A61F 2/86

[32] U.S. Cl. 623/1; 623/12; 623/11;
606/194; 606/195; 606/198

[58] Field of Search 623/1, 11, 12;
606/194-200, 157-158; 600/36

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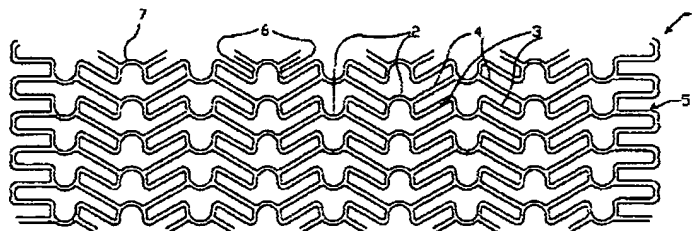
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Primary Examiner—John G. Weiss
Assistant Examiner—Francis K. Cuddihy
Attorney, Agent, or Firm—Kanesaka & Takazuchi

[57] ABSTRACT

An expandable tubular reinforcing member of the invention is used for a body lumen. The reinforcing member is basically formed of a plurality of rows of expandable joint members and a plurality of rows of flexible elongated members. The joint members in one row are arranged in a circular form and are spaced apart from each other. The elongated members in one row are arranged in a circular form, and each flexible elongated member extends diagonally to a central axis of the reinforcing member and connects two of the joint members situated in adjacent two rows. When a radial force is applied from an inside of the reinforcing member, the elongated members are bent relative to the joint members to have a larger diameter.

18 Claims, 2 Drawing Sheets



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4	US 4776337	USP:19881011	23	E	
5	US 4856516	USP:19890815	6	E	
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8	US 5011486	USP:19910430	11	C	
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15	US 5116365	USP:19920526	9	S	
16	US 5135536	USP:19920804	9	E	
17	US 5167614	USP:19921201	5	P	
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25	US 5356423	USP:19941018	7	R	
26	US 5382259	USP:19950117	15	V	
27	US 5389106	USP:19950214	6	I	
28	US 5403341	USP:19950404	12	P	
29	US 5405380	USP:19950411	9	C	
30	US 5411551	USP:19950502	7	S	
31	US 5411549	USP:19950502	7	S	
32	US 5441515	USP:19950815	20	R	
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34	US 5514176	USP:19960507	8	P	
35	US 5514154	USP:19960507	11	E	
36	US 5551954	USP:19960903	11	B	
37	US 5571166	USP:19961105	14	M	
38	US 5575818	USP:19961119	13	E	
39	US 5575816	USP:19961119	9	H	
40	US 5578075	USP:19961126	11	M	
41	US 5591227	USP:19970107	14	D	

United States Patent [19]
Simon et al.

[11] Patent Number: 5,354,308
[45] Date of Patent: Oct. 11, 1994

[34] METAL WIRE STENT

[75] Inventors: Morris Simon, Boston; Dmitry J. Rabkin, Brookline; Stephen Klashinsky, Scituate, all of Mass.

[73] Assignee: Beth Israel Hospital Association, Boston, Mass.

[21] Appl. No.: 878,184

[22] Filed: May 1, 1992

[51] Int. Cl. A61M 29/08

[52] U.S. Cl. 606/198; 623/12; 623/1

[58] Field of Search 623/1, 12; 606/191, 606/192, 198

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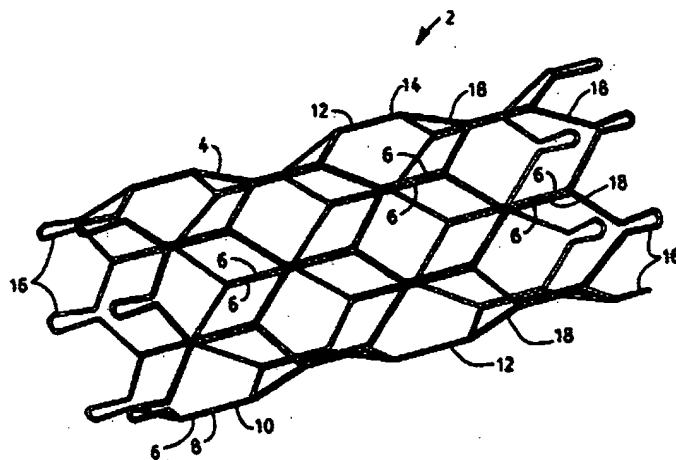
1205743 9/1970 United Kingdom 601/198

Primary Examiner—Jerome L. Kruter
Attorney, Agent, or Firm—Lorusso & Lond

[57] ABSTRACT

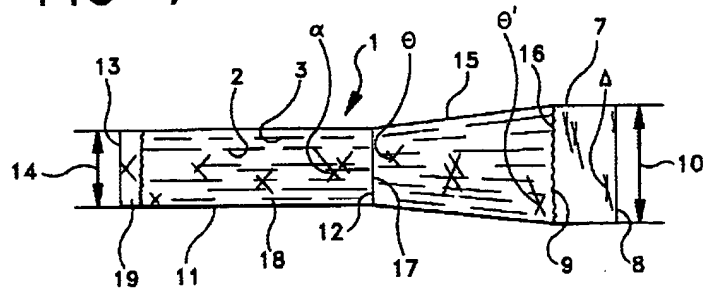
A stent comprising a wire skeletal frame, the frame being adapted to assume a first condition in which the frame is relatively rigid and substantially tubular in configuration and a second condition in which the frame is flexible, of reduced stress, and collapsible, such that in the second condition walls of the frame are adapted to be positioned against each other to form a stent diameter substantially equal to the combined thickness of the frame walls in abutting engagement with each other, the frame in its second condition being substantially devoid of bias therein urging the frame to assume the first configuration.

11 Claims, 5 Drawing Sheets



	Document	I	K	Source	Doc	Page	*
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2	US 6540777	USP	20030401	19	L		
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41	US 2003002	US	20030206	15	C		

FIG-7



	Document I	K Sou	Issue-De	Page	*
58	US 2003000	US-	20030109	20	A
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60	US 2003000	US-	20030109	11	e
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96	US 6485511	USP	20021126	13	E
97	US 6485510	USP	20021126	28	M
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(12) United States Patent
Killion et al.

(10) Patent No.: 6,405,207 B2
(45) Date of Patent: *Nov. 26, 2002

(54) STENT HAVING VARIABLE PROPERTIES
AND METHOD OF ITS USE

(75) Inventors: Douglas P. Killion, Maple Grove, MN
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MN (US)

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(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 9 days.

This patent is subject to a terminal dis-
claimer.

(21) Appl. No.: 09/735,388

(22) Filed: Dec. 12, 2000

(65) Prior Publication Data

US 2001/0004705 A1 Jun. 21, 2001

Related U.S. Application Data

(60) Continuation of application No. 09/314,658, filed on May
19, 1999, now Pat. No. 6,159,238, which is a division of
application No. 09/034,249, filed on Mar. 4, 1998, now Pat.
No. 5,938,697.

(51) Int. Cl.⁷ A61F 2/06

(52) U.S. Cl. 623/1.18; 623/1.16; 623/1.3

(58) Field of Search 623/1.15, 1.16,
623/1.17, 1.2, 1.3, 1.31

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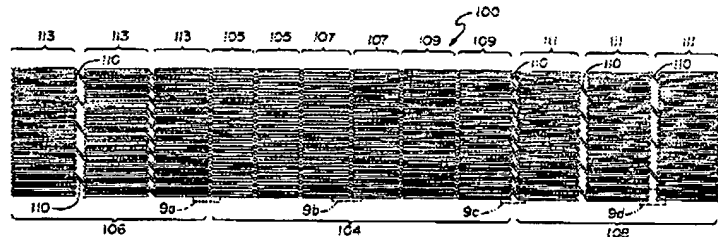
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(57) ABSTRACT

A stent and method of its use, the stent is in its expanded
configuration, exhibiting varying outward radial force along
its length. In use, the expanded stent is of a tapered con-
figuration which provides greater force in vessel regions
requiring greater force and less force in regions requiring
less. In particular the stent is useful in the ostium regions and
at areas of bifurcation in vessels. Varying force over the
length of the stent is achieved by varying the number of
elements, the density of elements, the thickness of the
elements making up the stent body, and maintaining a
substantially metal to artery ratio in the expanded stent over
its length.

20 Claims, 5 Drawing Sheets



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[21] Appl. No.: 193,314

[22] Filed: Feb. 8, 1994

[51] Int. Cl. 6 A61F 2/06

[52] U.S. Cl. 623/1; 623/9; 623/12

[58] Field of Search 623/1, 12, 9; 606/192, 606/194, 195, 197

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[57] ABSTRACT

This invention relates to a graft for placement in a body passageway. The graft comprises a longitudinally extending thin walled cylinder having first and second open ends. The graft is divided into first and second axially extending end portions adjacent such open ends and an axially extending central portion therebetween. The walls of the central portion are provided with circumferential crimps and the wall of the end portions are provided with axially extending crimps whereby the central portion can be extended longitudinally to vary the distance between the end portions and the end portions may be expanded radially to vary the diameter of the end portions. In preferred embodiment the end portions have a greater diameter than the central portion imparting to the graft a somewhat dumbbell like shape preferable in employing the graft in the reduced diameter lumen of a diseased blood vessel.

21 Claims, 4 Drawing Sheets

